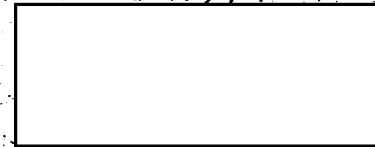



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J. 2. a. (1) (a) 1 KH-4 (Future Requirements)

a Future requirements for KH-4 panoramic and frame 25X1  
photography pertain to the time period between January 1968 and July 1970,  
at which time the KH-4 system is scheduled to be replaced by the system under  
development to meet the requirements for NEW SEARCH. The expression of re-  
quirements in this study assumes that there will not be major changes in the  
KH-4 system during this period that will affect accuracies achievable for  
meeting mapping and charting requirements. In essence, this means that we  
will have the benefit of the  through the period in con- 25X1  
cern, but do not expect major improvements to result from the pan geometry  
development.

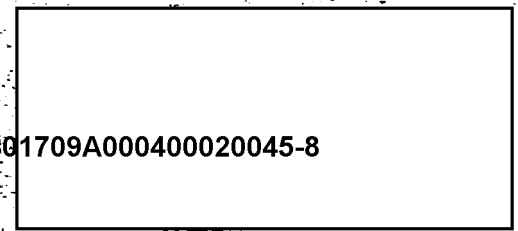
b Presently, the geographic areas outside the Sino-  
Soviet bloc for which KH-4 pan and frame coverage are required comprise 24.1  
million square miles. As of December 1967, 15 million square miles of once-  
over coverage have been obtained, leaving a remaining requirement of approxi-  
mately 9.1 million square miles. Changes in the geographic area requirements  
for different maps and charts, changes in conventional photography programs,  
changes in contributions of foreign countries in terms of map or photography  
programs may cause some change in the <sup>present</sup> 24.1 million square miles collection re-  
quirement area, but the net effect of such changes is not anticipated to create  
a change of more than 1-2 million square miles.

NRO review(s) completed.

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c Currently, there are extremely wide applications of KH-4 photography, and as greater production capability can be made available to work on areas outside the Sino-Soviet bloc, there will be further expansion of the use of this data. The basic justification for collecting this data in the past and continuing this collection are three-fold: To serve as a data bank of information to insure timely response to emergency requirements; secondly, to serve as the primary source material in the production of medium and small-scale maps and charts in line with JCS priorities, especially in areas of no access and no cooperative foreign programs, and thirdly, to provide improvements in geodetic positioning for the production of maps and charts and the location of targets on a worldwide basis. Projected uses of KH-4 data are summarized elsewhere in this report.

d The need for aerial or satellite photography to permit the updating of primarily cultural information on maps and charts varies from 5 to 10 years for highly developed areas, 8 to 15 years for moderately developed areas and 10 to 20 years for undeveloped regions. Exceptions to these standards occur in areas of current military operations and limited local areas of extreme cultural development. By 1970, some of the KH-4 coverage outside the Sino-Soviet area will be approaching obsolescence by these standards. However, recoverage for this purpose will be postponed until the NEW SEARCH system [ ] which will provide the very important added advantage of enabling production to meet increased accuracies and a reduction in costs of production.

e. Completing coverage for the entire remaining 9.1 million square mile area is virtually impossible because of the very

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high percentage of persistently cloudy regions. Where weather is not the predominant factor, the coverage task is primarily a matter of completing slivers and gap areas and, as in the case of bad weather areas, generally require an increasing amount of film expended for the net coverage achieved. Coverage of remaining areas will in no case require special missions, as limitations caused by weather and the current accuracy with which weather can be predicted result in no shortage of film for the relatively cloud-free areas, worldwide, during the life of the mission. The estimate of the hard-core area that will not be feasible to be covered by satellite photography is approximately 3 million square miles of the 9.1 million square miles. As the remaining areas decrease, more attention can be given to the individual areas and study will be given to the benefits that may be achieved in relatively local areas by altering launch times, assuming that degradation to prime purposes of the mission will not be significant or unacceptable. Additionally, more detailed studies as to seasonal weather conditions and other factors may prove useful.

f Evaluation of KH-4 pan and frame photography outside the Sino-Soviet area is done on a priority basis, and criteria involving a 10 thousand square mile minimum area are being used. More detailed evaluation of such coverage as production programs are planned results in defining limited areas that are not covered at all, or are covered so poorly that additional coverage is necessary. Such areas are evaluated sufficiently in advance of major production programs as to permit time to obtain additional coverage or recoverage.

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g The change from the [ ] beginning in

the fall of 1967, has brought a major change in collection requirements. The

[ ] provides for approximately [ ] frame camera exposures per mis-

sion for strictly MC&G use in/ to the [ ] used in conjunction with

the pan camera operations. Further, when considered in conjunction with the

KH-4 panoramic photography, the [ ] provides increased accuracy and lower

production cost compared to the [ ] camera of the KH-4 [ ]

Principal uses of the [ ] camera are for production of small-scale maps

and charts (smaller than 1:250,000), both for photo revision and for photo-

grammetric compilations to provide improved position bases for new contours;

secondly, for establishing photogrammetric control points for production of

medium-scale Multiple Use Manuscripts for Target Charts and Joint Operational

Graphics, and thirdly, for obtaining geodetic-type coverage for "short arc"

geodetic solutions and filling holes in geodetic frame camera coverage to

permit completion of geodetic networks. Evaluations of the benefits of [ ]

[ ] particularly in the light of the free-wheeling coverage of ap-

proximately [ ] per mission, has resulted in collection require-

ments practically worldwide, arranged in 3 priorities for mapping and chart-

ing, and limited geodetic requirements that can be filled by strip-type cover-

age. Evaluation of particular coverage requirements for short-arc ties is

currently under way.

h Since KH-5 and related data, together with current  
overt programs, have now been evaluated to be inadequate to meet the worldwide

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positioning requirement

assurance with respect to the WGS, consideration will be given to various ways and means of meeting the geodetic requirement.

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J. 2. a. (1) (a) 3 Future Requirements - NEW SEARCH System

a Assumptions

The following principal assumptions pertain:

1 NEW SEARCH will have a [ ] camera system 25X1  
designed to meet large-scale map accuracy requirements.

2 NEW SEARCH will be operational [ ] 25X1  
and will begin replacing the KH-4 system at that time to meet USIB approved requirements.

3 KH-4 panoramic and frame-type coverage will  
be available by July 1970 for all of the 24 million square miles requirement area except for approximately 3 million square miles in the tropical belt difficult weather areas. Three-inch frame camera coverage from the KH-4 system will be available world-wide, except for difficult weather areas of the tropical belt.

4 No major changes will occur in the technical capability of the KH-4 system to meet large-scale map accuracy requirements.

b Mapping Coverage Requirements

NEW SEARCH photography is needed world-wide to provide large-scale maps on a timely basis. Presently there is a large-scale mapping requirement extending over 19.1 million square miles. To complete initial once-over coverage of large-scale maps, satellite photography is required for 6.7 million square miles. Existing maps and conventional photography and mapping data available by 1971 contribute 10.7 million square 25X1



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miles and the remaining source material deficiency of [ ] million square miles is not considered collectable by visual photography, due to difficult weather. Unless, by 1971, field control is completed and mapping from conventional data is nearing completion, it may be more practical and economical to obtain additional satellite photography to complete mapping for the 10.7 million square mile area. For maintaining initial coverage of large-scale maps, foreign countries and US domestic agencies can be expected to maintain approximately 8 million square miles of map coverage, and satellite photography will be needed at required frequencies for 11 million square miles for DoD maintenance programs. Of this 11 million square miles, approximately 4 million square miles cover areas within the Sino-Soviet bloc. This photo collection area may increase if we find it expedient to forego cooperative maintenance considerations for timeliness and efficiencies of NEW SEARCH.

2 There is a medium-scale mapping and charting requirement for approximately 51 million square miles. While KH-4 photography, particularly with [ ] has been somewhat marginal in meeting accuracy requirements for medium-scale maps and charts, it will be available for completing initial mapping coverage for all required areas, except tropical belt difficult weather areas. NEW SEARCH coverage strictly for initial production of medium-scale maps and charts will not be required in areas, except tropical belt difficult weather areas. NEW SEARCH coverage strictly for initial production of medium-scale maps and charts will not be required unless proven

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justified in limited areas on a cost effectiveness basis, or the coverage and techniques used in the KH-4 compilation fell short of meeting accuracy requirements over some priority areas. Some of the early compilations using the [ ] fell short of meeting medium-scale accuracy requirements over some priority areas. Some of the early compilations using the [ ] fell short of meeting medium-scale accuracy requirements. However, since there are so many areas world-wide for which very inaccurate or no contours are available demanding the use of our contour capability, recompilation of early compilations will generally not be justified until such time as NEW SEARCH coverage will be required for updating purposes. [ ]

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[ ] Twenty-four million square miles of the 37 million square miles outside the Sino-Soviet area, and of the 24 million square miles, approximately 10 million square miles can be maintained by only the frame camera coverage of NEW SEARCH photography.

3 Small-scale mapping and charting requirements exist for the entire worldwide areas. KH-4 satellite photography will be used as needed for initial production. NEW SEARCH frame photography will be needed at required frequencies for entire area for US maintenance program. 25X1

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4. The primary factors justifying coverage requirements for NEW SEARCH satellite photography over the first five years after 1970 are:

a To provide a rapid response capability world-wide and for initial production of maps that will meet large-scale accuracy requirements for the [REDACTED]

[REDACTED] Most of the coverage should be completed in the first year.

b To update maps and charts, particularly for cultural features, satellite photography is required at the following frequencies: (Exceptions to these standards occur in areas of current military operations and limited local areas of extreme cultural development.)

1 Highly developed areas, 5-10 years.

2 Moderately developed areas, 8-15 years.

3 Generally undeveloped areas, 10-20 years.

c To provide source materials for expanded utilization based on modified end products and improved equipment-personnel production capability.

5 Satellite photography obtained to meet large-scale accuracy requirements will serve to meet medium and small-scale requirements. Coverage obtained to meet medium-scale requirements will meet small-scale requirements. Except for the under-developed areas of the

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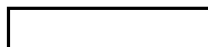
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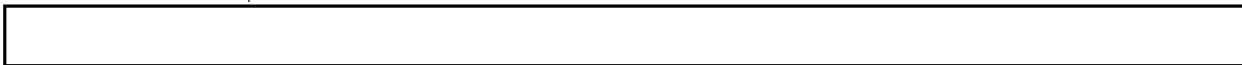
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interior of South America, Africa 

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and several progressive countries where conventional programs are under way, there is a potential large-scale requirement within areas of medium-scale requirements. Over a period of 7-8 years, this could increase 

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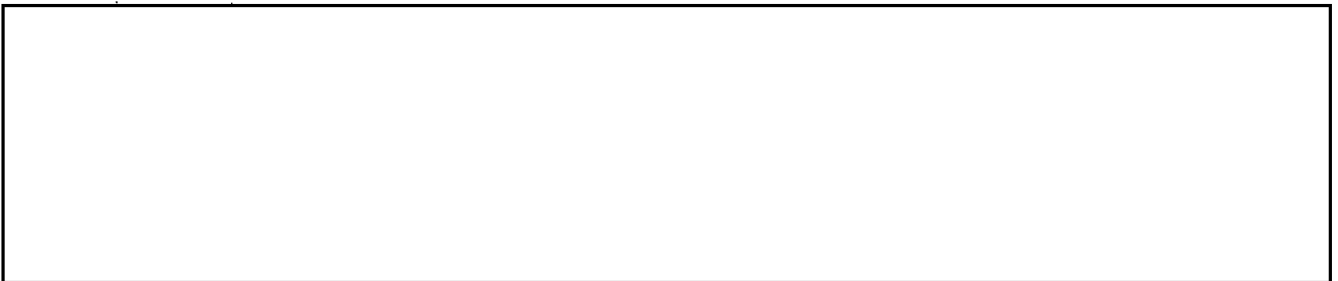


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NEW SEARCH coverage obtained for search purposes over the Sino-Soviet area (13 million square miles) will meet MC&G requirements of the area. MC&G requirements within the Sino-Soviet area may affect lower priority intelligence requirements established for the Sino-Soviet area.

6 Annual collection requirements for NEW SEARCH satellite photography (90% net usable) outside the Sino-Soviet area for 1970-1975 for mapping purposes are estimated as follows:


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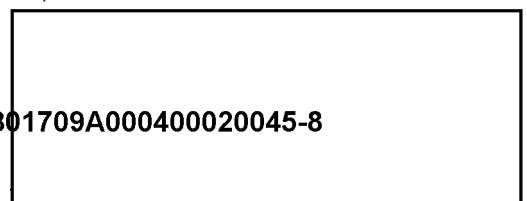
c Geodetic Requirements

NEW SEARCH photography is not needed to meet, by 1971, the positioning requirement of 

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 with respect to the WGS over Sino-Soviet areas. However, outside the Sino-Soviet area where the worldwide positioning requirement is of much lower priority, there is a requirement for photogrammetric control for mapping where geodetic surveys are only partially complete. For this requirement

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studies are being made to determine to what extent NEW SEARCH photography could provide control densification rather than conducting non-photographic geodetic surveys. NEW SEARCH photography would be needed if the worldwide positioning requirement were changed [REDACTED]

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[REDACTED] assurance, with respect to the WGS.

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## J. 2. a. (1) (a) 4 Other-Geodetic

As continued advances are made in the delivery accuracies of weapons systems, our knowledge of the geodetic relationship between the launch and target positions must also be improved. To support the near term systems (Advanced Minuteman), the requirement for geodetic

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positions of targets is [redacted] assur-

ance, relative to the World Geodetic System. This supports a total Geodesy

and Gravity (G&G) CEP of approximately [redacted] If, for follow-on systems

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beginning after 1973, an extremely accurate all inertial self-contained guid-

ance system is chosen (and this is believed to be more likely than off-road

mobile or rail mobile systems) a requirement for an over-all reduction in the

G&G contribution to the error budget of [redacted] CEP or less could result. To

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support such an objective, it would be necessary to determine the target posi-

tions to an accuracy of [redacted] assur-

ance, relative to the World Geodetic System. It has been determined that the

[redacted] materials from the KH-5 system are not adequate to meet the near term re-

quirements of [redacted] There-

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fore, it is necessary to consider alternate approaches for meeting the require-

ment. Considering only the solution to this near-term requirement of the [redacted]

[redacted] assurance, the following approaches

can be considered:

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Short Arc (J-3)

The photographic system specifications of the improved KH-4 system appear to be adequate for the near term requirements of the Sino-Soviet area. If the design specifications are met, the over-all accuracy ob-

tainable is primarily a function of the operational concept and the ephemeris

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accuracy which can be derived. One approach to minimizing the effects of gravity and drag is to use short orbital arcs which can be tied at some points to control. It is probable that such an approach would provide ephemeris accuracies to support the positioning of targets to about [REDACTED] assurance, but this does not meet the [REDACTED] requirement.

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J-3 System With Doppler and Accelerometer

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If the photography and attitude on the improved KH-4 system proves to be adequate, the remaining problem is accurate ephemeris determination. The ephemeris accuracy could be significantly improved if a

[REDACTED]

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[REDACTED] The near term requirement could probably be

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met with such a system if [REDACTED]

[REDACTED]

It is our

understanding that such an approach is technically feasible within the next year.

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[REDACTED]

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Promising solutions as seen at this time would be a combination of NEW SEARCH,  
with a precise tracking system for ephemeris determination,

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